

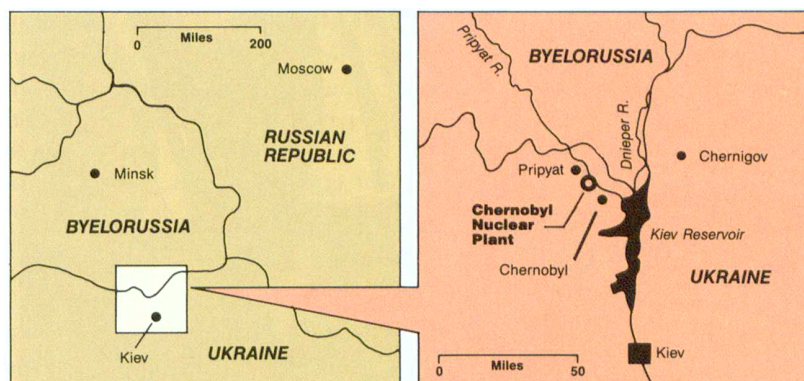
## U.S. AND IAEA CHERNOBYL DELEGATIONS ASSESS RADIATION EFFECTS

**F**OLLOWING THE APRIL 1986 explosion at the Chernobyl nuclear reactor, the Soviet government evacuated 135,000 people living in the immediate vicinity of the plant, mobilized workers to clean up the site and surrounding areas, and called on outside governments and organizations to render medical aid and help in the assessment of health effects related to radiation exposure. A series of contacts between the United States and the Soviet Union led to an agreement in 1988 to establish the U.S. - U.S.S.R. Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCNRS). And, in 1989, the Soviets asked the International Atomic Energy Agency (IAEA) to send an international delegation to the Soviet Union to evaluate the health of the people living in the area of the accident.

### U.S. Delegation

Once the JCCNRS was established, the Committee agreed that the U.S. would provide expertise in power reactor safety and design, the training of reactor operators, and the analysis of the effects of low-level radiation to the Soviets. One of the Committee's 11 working groups was designated to study the health effects of low-level radiation on the thyroid and the incidence of leukemia and other cancers. This health effects group sent a delegation to Kiev in December to meet with Soviet officials and physicians, examine people living in the contaminated zone, and work with the Soviets to develop a protocol for a follow-up study.

The U.S. delegation of ten scientists and physicians, headed by David V. Becker, MD, professor of radiology and medicine and director of nuclear



*The Ukraine, Byelorussia, and Russia were the three republics most affected by the Chernobyl accident.*

medicine at New York Hospital-Cornell Medical Center in New York City, a member of The Society of Nuclear Medicine's (SNM) Committee on the Radiobiological Effects of Ionizing Radiation (REIR), included experts in the fields of thyroidology, dosimetry, epidemiology, and radiation effects.

The delegation spent its first three days in Chernigov, which is about 85 miles (137 kilometers) north of Kiev, attending a World Health Organization (WHO) symposium at which Soviet investigators presented papers on Chernobyl radiation data and U.S. investigators presented papers on iodine metabolism, dosimetry, and radiation epidemiology. Soviet physicians answered questions from the international medical community on data collection methods and the medical condition of patients.

The U.S. delegation then returned to Kiev, which is about 75 miles (121 kilometers) south of Chernobyl, met with its Soviet counterparts, and toured the facilities of the Research Institute of Endocrinology and the All-Union Institute of Radiological Health, both of which treated Chernobyl acci-

dent victims. The Research Institute received many of the early Chernobyl victims because it was the closest hospital to the accident site. As part of the additional efforts to provide care to the victims, the Soviet government set up the All-Union Institute. Physicians at these two facilities discussed their cases with members of the U.S. delegation.

Although the Soviets provided Russian translators for the U.S. delegation, the language barrier often made it difficult for members of the U.S. group to communicate effectively with Soviet scientists, physicians, and patients. Nevertheless, according to Dr. Becker, patient examinations and discussions with the physicians and scientists were extremely useful in allowing the U.S. delegation to develop a background of data and assess the current situation in these hospitals.

U.S. delegation member A. Bertrand Brill, MD, PhD, professor of nuclear medicine and director of research in the department of nuclear medicine at the University of Massachusetts Medical Center in Worcester, Massachusetts, Chairman of SNM's REIR Committee, says that "the scien-



*Some members of the U.S. delegation: (l to r) D. Becker, J. Robbins, A.B. Brill, A. Bouville, J. Wolff, G. Beebe, B. Wachholz*

tists in the Kiev area did a fine job in collecting and calibrating large numbers of detectors and taking measurements on hundreds of thousands of people. Their dosimetry and instrumentation skills are first rate." He cautions, however, that "there are significant uncertainties in thyroid dose reconstruction due to variations in individual intake by ingestion and inhalation." He notes that doses will be especially difficult to reconstruct in the areas where the milk ingested came from the family cow. Dr. Becker noted that most of the people in the contaminated zone want to be relocated. If this is done, it will further complicate efforts to follow the population's evolving medical condition.

Dr. Becker cautions that researchers collecting data for a thyroid study will have trouble distinguishing spontaneously arising thyroid abnormalities from excess abnormalities due to radiation. He points out that "half of all dead people have small lesions in their thyroid." He also notes that ultrasound instruments, which the researchers have relied on, have diagnostic limits. "Ultrasound equipment

cannot distinguish between cancer and a benign tumor." This adds to the difficulty in diagnosing patients.

Dr. Becker notes that the Chernobyl research is focusing on the children who were exposed to radiation because children are more sensitive to radiation than are adults. The vast majority of children received relatively small amounts of radiation due to the accident. Some preliminary data indicate that 80,000 children received thyroid doses from radioactive iodine of less than 200 Rem (2 Sv), while 12,000 received doses between 200-500 Rem (2-5 Sv), and 4,000 received doses greater than 500 Rem (5 Sv). These children, who received unknown amounts of radiation through ingestion and inhalation, may develop hypothyroidism or cancer of the thyroid. Since the full incidence of thyroid cancers may not be expressed for 30 years, it is important to institute protocols for an ongoing study that will follow these children throughout their lifetimes.

Dr. Becker stresses that "news reports of large numbers of people with leukemia and other cancers are simply not true." He reports that the psycho-

logical pressure of living in uncertainty for five years in areas that received fallout has led people to experience many physical symptoms. A new term, "vegetative dystonia," has been coined to describe a range of psychologically induced symptoms, such as hypertension and gastrointestinal disorders.

The estimated 30,000-500,000 workers, called liquidators, who brought the Chernobyl reactor fire under control and cleaned up the plant site and surrounding areas after the accident, are also being closely monitored. Many of these workers received hundreds of Rads (several Grays) of whole-body radiation during the plant clean-up. A few of the workers died of burns in the fire, and a 1989 Soviet report stated that the death toll for liquidators and plant workers at the time of the accident had risen to 250. However, no figures have been released stating how many of those deaths were due to radiation exposure.

Dr. Becker says that in one area containing two million people, the level of background radiation was fifteen times normal due to cesium contamination in the soil. The Soviet government has indicated that the people who are living in the areas of highest cesium contamination will be relocated.

After looking at dosimetry data supplied by the Soviets and discussing with the Soviets possible parameters for an epidemiological study, members of the U.S. delegation recommended a rigorously controlled study limited to the 30,000-40,000 children who received the highest doses of radiation. The Soviets would like to include a much larger number of children who were exposed to lesser amounts of radiation, numbering approximately 300,000. Discussions on the protocol are still continuing, and when a consensus is reached, the U.S. delegation will write up an epidemiological study grant proposal and submit it to the Nuclear Regulatory Commission (NRC).

### Medical Aid Offered

In the interim, the Japanese government and some private Japanese corporations recently pledged financial aid for medical supplies for those effected by the radiation from Chernobyl. According to Dr. Brill, the Japanese will provide \$20 million in the first year and \$180 million in the second year. The money will be channeled through the WHO, which will coordinate a health care program. According to Dr. Brill, a portion of the money will be used to outfit 10-12 trailers with ultrasound equipment, and these trailers will operate in the fallout zone as mobile medical centers.

The U.S. government has also recently agreed to ship medication and equipment to the Ukraine to treat Chernobyl accident victims. This additional medical aid from Japan and the U.S. may mitigate the Soviet government's desire for a joint U.S.-U.S.S.R. study of 300,000 children.

### IAEA Delegation

The IAEA project was initiated in October 1989, when the Soviet government asked the Agency to do an independent investigation of the population's radiation exposure. The project got underway in February 1990 and was divided into five phases; a task group was appointed for each phase. The phase-one task group wrote an historical report on the Chernobyl accident. The environmental task group reviewed Soviet data on contamination and took samples for corroboration through independent laboratories. This group will compare its results with those of the Soviets to see how well the data correlate. The dosimetry task group reviewed Soviet data including the methodology used in dose calculations. The health effects task group evaluated the health of a portion of the population living in the contaminated areas. It sought evidence of physical and psychological injury due to either radiation exposure or the explosion. Group members reviewed

Soviet data collected after the explosion and collected data independently. The latter will be used to validate the Soviet information and to make an assessment for the future. The phase-five task group, the counter measures task group, looked at ways to counter damage already done and to minimize future damage. This group addressed the problem of how to reduce further intake and exposures. It reviewed specific issues including the cost of no longer growing an existing crop and replacing it with a different crop, the effects of deep plowing, and the costs and effects of relocation.

The health effects group was led by Fred Mettler, MD, professor and chairman of the departments of radiology and nuclear medicine at the University of New Mexico in Albuquerque. Dr. Mettler assembled an international team of 100 physicians and scientists with no government or nuclear industry connections so that the credibility of the group's results would not suffer from the perception of bias on the part of the participants. Dr. Mettler included representatives from the WHO on the trips because the WHO is expected to coordinate the efforts of the different nations and agencies rendering medical assistance.

The health effects group made 11 trips to the Soviet Union, with about six participants on each trip. A thyroidologist, a pediatrician, a hematologist, a radiation effects specialist, and a general physician were included on each of the three trips during which field experiments were conducted.

The groups visited 13 villages in the Ukraine, Byelorussia, and the Russian Republic, collecting medical data on 2,000 people. Seven of the villages were contaminated and the other six were used as controls. The contaminated villages were chosen to represent all geographic areas within the irradiated zone. Specifically, the study groups looked at the most heavily contaminated inhabited villages that were large enough to have a clinic and electricity yet small enough so that at



*Chernobyl nuclear power plant after explosion at one of its reactors*

least 20% of each of five selected age groups could be examined. This last criterion was imposed so that results would not be skewed if the patients examined represented only the sickest people in the village. The IAEA physicians examined 2-, 5-, 10-, 40-, and 60-year-olds in each village, giving each participant a complete physical, checking the thyroid function, doing an ultrasound exam of the thyroid, and taking total and differential blood counts. Chromosome and blood lead analyses were done on selected people. In addition to examining members of the study sample, the IAEA physicians offered to examine patients referred by the local physicians.

Dr. Mettler said that he was pleased with the ability of the Soviet interpreters who accompanied the physicians on their field trips. The same interpreters were used for all of the

trips to ensure that medical terms were being translated in a comparable manner throughout the data collection period.

James Hurley, MD, associate professor of medicine and radiology and associate director of the division of nuclear medicine at New York Hospital-Cornell Medical Center, a member of the IAEA delegation, describes the IAEA's study as a "top to bottom re-assessment of the whole accident." Dr. Hurley says that once the IAEA project is completed, he expects the Agency will project lifetime radiation doses for people living in the fallout zone.

The data collected by the IAEA on the villagers (over two million data entries) has been sent to England and Japan for epidemiologic analysis. The results will be made public when the IAEA presents its report on "The Radiological Consequences in the U.S.S.R. of the Chernobyl Accident" this May in Vienna, Austria.

### Radiation Phobia

The people living in the contaminated zone are unlikely to accept the reports of the U.S. and IAEA delegations on the health effects of the radiation. The stage for this mistrust was set when the Soviet government waited for two days after the Chernobyl explosion before notifying the popula-

tions of neighboring cities and towns that there had been a release of radiation from the Chernobyl nuclear plant. The government also waited for over a month before it evacuated many of those in the most contaminated regions. All the while, it kept reassuring the public that the radiation danger was minimal. By the time the Soviet government started to acknowledge the seriousness of the accident, it had lost much of its credibility with the people in the affected area. Dr. Becker points out that for two years the Soviet government didn't say anything to the public about the doses they had received, so that "now people don't believe the exposure data."

This mistrust of official Soviet reports about the level of radiation contamination has widened to include mistrust of the international radiologic community. The people in the radia-

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tion zone are suspicious of groups who were asked to collect data on behalf of the Soviet government because they fear that these organizations will publish results that corroborate the Soviet government's radiation data, regardless of their actual findings. Commenting on the atmosphere of suspicion he encountered while in the Soviet Union, Dr. Brill states that "the public is terribly concerned about the radiation risks. They don't trust anybody." Dr. Becker concurs, stating that "there is radiation phobia in this area."

This paranoia is now so ingrained that the Ukrainian and Byelorussian local governments are starting to collect their own data on radiation exposure and health problems. Local residents and many local physicians are more likely to accept these data as accurate. The mistrust of the Soviet government is exacerbated by rising nationalist sentiment in the Ukrainian and Byelorussian republics. The local governments have become a rallying point for all issues in which the local populace believes it is treated unfairly by the Soviet government. The radiation effects of Chernobyl have thus become the latest points of contention between the local and Soviet governments.

The psychological toll of Chernobyl complicates the task of physicians and scientists tremendously. Dr. Brill acknowledges this complication when he summarizes the goals of the scientists and physicians who went to Chernobyl. "We have been asked to

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**"We have been asked to carry out two missions. One, requested by the U.S., is scientific — to collect data on the effects of radiation. The other, requested by the Soviet Union, is to address the medical, psychological, and economic needs of the population living in the contaminated areas of the Soviet Union."**

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## The two criteria for departure are to be interpreted broadly, allowing for "a great deal of latitude in the best interest of the patient."

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### ACMUI

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petition and interim response.

In other presentations during the ACMUI meeting, the NRC announced that Myron Pollycove, MD, professor of laboratory medicine and radiology, director of the nuclear medicine department, of the San Francisco General Hospital, California, and Mark H. Rotman, MS, PharmD, BCNP, chief of the radiolabeling unit, monoclonal antibody section, department of nuclear medicine, National Institutes of Health, Bethesda, Maryland, have been "selected, pending final negotiations" into the agency's Medical Visiting Fellows Program. Larry W. Camper, section leader of the NRC's medical and academic section, says that fellowships are expected to last "at least one year and possibly two years." According to Mr. Camper, projects for physician fellows might include: assisting the NRC in establishing "what constitutes an adequate preceptorship" and taking a "further look at misadministrations." Projects for radiopharmacist fellows might

include: assisting the NRC with "potential regulatory changes relative to some of the emerging radiopharmaceuticals," such as radiolabeled biologics, and providing "input as the Commission works to resolve the remaining issues in the radiopharmacy petition submitted by the SNM and the ACNP." Mr. Camper noted that "one of the primary objectives" of the fellows program is "to develop a cadre of individuals that the Commission could turn to in the future," when it is presented with "complex regulatory issues impacting on the practice of nuclear medicine." Dr. Siegel says, "The most important reason to have such experienced nuclear medicine professionals within the NRC is to establish a readily available link to the reality of how nuclear medicine is practiced."

According to Mr. Camper, "There will be further *Federal Register* notices calling for additional applicants to the Program. Such notices will be timed to coincide with the agency's need and the terms of the existing fellowships."

The NRC renewed its call for addi-

tional ACMUI members during the meeting. According to Dr. Siegel, the NRC has asked the Secretary of Health and Human Services and the Food and Drug Administration Commissioner to nominate Public Health Service and FDA representatives. The NRC is also seeking "an expert in brachytherapy, someone who can represent the interests of the states, and a consumer representative," says Dr. Siegel.

During the ACMUI meeting, Dr. Alazraki, Robert E. Henkin, MD, immediate past president of ACNP, and Sharon A. Surrel, CNMT, Chairwoman of the SNM Technologist Section Government Relations Committee, made statements relating to the issues before the Committee.

The next ACMUI Meeting is scheduled for May 1991.

Sarah M. Tilyou

### ACMUI Members

Barry A. Siegel, MD  
(Chairman)

Peter R. Almond, PhD

Capt. William H. Briner  
(USPHS, ret.)

Vincent P. Collins, MD

Jack K. Goodrich, MD

Melvin L. Griem, MD

Nilo E. Herrera, MD

Carol S. Marcus, PhD, MD

Joan A. McKeown

Gerald M. Pohost, MD

Edward W. Webster, PhD

### Chernobyl

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nated areas of the Soviet Union." The tragic accident at Chernobyl has ironically provided scientists with a wealth of data and an excellent opportunity to study the health effects of radiation. The knowledge gained may be used by medical practitioners and review bodies faced with the need to establish and review new procedures and guide-

lines involving human radiation exposures. At the same time, physicians and governments must grapple with how to handle the immense medical needs, both physical and psychological, of the massive numbers of people who were affected by the fallout from Chernobyl.

Joan Hiam